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Six-fold in-plane magnetic anisotropy in Co-implanted ZnO (0001)

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Abstract

Magnetic anisotropies of Co-implanted ZnO (0001) films grown on single-crystalline Al2O3 (11 2-0) substrates have been studied by ferromagnetic resonance (FMR) technique for different cobalt implantation doses. The FMR data show that the easy and hard axes have a periodicity of 60° in the film plane, in agreement with the hexagonal structure of the ZnO films. This six-fold in-plane magnetic anisotropy, which is observed for the first time in ZnO-based diluted magnetic semiconductors, is attributed to the substitution of cobalt on Zn sites in the ZnO structure, and a clear indication for long range ferromagnetic ordering between substitutional cobalt ions in the single-crystalline ZnO films. © 2009 American Institute of Physics.

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